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Field of Invention

This invention relates generally to the field of information acquisition and display devices on a real-time basis and more particularly to systems which monitor the operation of powered vehicles and which display the status or condition of various aspects of vehicle operation for the driver. The invention specifically relates to the display of systems involving the anti-lock braking system, the stability of the vehicle as to proximity to rolling over, the power consumed by vehicle components such as the heating system and lights and/or, for four-wheel drive vehicles, the torque and/or braking forces delivered to the wheels. The information is acquired from sensors and/or from signals generated by the vehicle and is processed by the vehicle CPU or, in another embodiment by a display CPU. The processed information is then displayed for the driver in black and white or in color using an LED, LCD, vacuum fl[u]orescent means, numerical display, gauge or meter.

~~Cross-references: None~~

~~Statement regarding the use of federal funds~~

~~No federal funding, direct or indirect, has been utilized in conjunction with the development of the present invention.~~

~~Statement regarding microfiche records~~

~~No microfiche records are used in the application submitted for the present invention.~~

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~~Prior Art~~

Background of the Invention

No prior art can be found which discloses the present invention. Historically the status of drive train components, of anti-locking brake system components, power usage by vehicle components, and/or of the approach of a rollover condition have not been displayed for the driver by any type of vehicle.

US Patent 6,398,688, by Brown, et al, however discloses a visual display in Figure 1 but without elaboration in the specification.

US Patent number 6,497,301 by Iida, et al, discloses an indicator 25 and alarming lamp and alarm 26 in Figure 1 without further elaboration in the specification. ~~Regrading~~ Regarding the same type of disclosure, reference is made to US Patent number 6,493,623 Nishida, et al.

US Patent number 6,603,393 by Sumada, et al, discloses a display for a vehicle operator for functional status of the ~~vehiclle~~ vehicle but only mentions an open hood latch. No ~~mentoin~~ mention is made of the dynamics of operation of the vehicle. ~~One useful embodiment of the present invention is the dynamic or real time display of the relative amounts of torque being transferred to the axles of a four-wheel drive vehicle.~~

US Patent number 5,825, 284, Dunwoody et al, discloses a system and method of calculating the approach of a rollover condition for a vehicle. The method described uses a "lateral load transfer" sensor to calculate the center of gravity which is an inoperable means to make this calculation. Restated, very low weight loadings on a vehicle can be configured which will give high lateral loading and which result in no turning moment whatever. The Dunwoody patent is completely inoperable. The present invention uses a harmonic frequency sensor which provides the means to calculate the center of gravity of a vehicle with great accuracy. With this and the input from a lateral acceleration sensor, the approach to a rollover condition of a vehicle is calculated with great accuracy.

US Patent number 5,949,330, Hoffman et al, discloses a general monitoring and diagnosing means without reference to monitoring vehicle parameters and without reference to the approach of a rollover condition of a vehicle.

US Pat number 6,721, 634, Hauler, et al, discloses the use of a "freely programmable instrument cluster" within a vehicle but does not recite any vehicle parameters which are to be monitored and displayed. No reference is made regard monitoring vehicle parameters which would indicate the approach of a rollover condition of a vehicle.

US Patent number 5,555,502, Opel, discloses a control system and an associated method with feedback input by the driver of a vehicle but does not recite any vehicle parameters which are to be monitored and displayed. No reference is made regard monitoring vehicle parameters which would indicate the approach of a rollover condition of a vehicle.

US patent number 5,880,710, Jabei, et al, utilizes a filtering and selection means for information but does not recite any vehicle parameters which are to be monitored and displayed. No reference is made regard monitoring vehicle parameters which would indicate the approach of a rollover condition of a vehicle.

US patent number 4,594,572, Haubner, et al, discloses a complex display means and primarily addresses the processing of information. The sole example given of a condition to be monitored is that of an open trunk compartment. Otherwise it does not recite any vehicle parameters which are to be monitored and displayed. No reference is made regarding the monitoring of vehicle parameters which would indicate the approach of a rollover condition of a vehicle.

US patent number 5,949,345, Berkert, et al, discloses a system based upon a computer program without the utilization of a dedicated display. The sole vehicle parameter mentioned which is to be monitored is the fuel gauge. Torque related information, as delivered to the wheels and the approach to a rollover condition by a vehicle are not mentioned.

The present invention discloses the use of a dynamic or real time display of the relative amounts of torque being transferred to the axles of a four-wheel drive vehicle and the use of an accurate monitoring means to indicate the approach of a rollover condition of a vehicle. These types of displays are ~~This information is~~ currently unavailable to vehicle operators. No patents, no publications and no known application disclose the method, system, process, apparatus or the types of displays disclosed herein by the present invention.

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Summary of the Invention

The present invention is an apparatus, method, process and system for displaying real-time operational information about a motor vehicle to the driver. The invention specifically relates to the display of the status of systems involving the anti-lock braking system, the stability of the vehicle as to the approach of a rollover condition, the power consumed by vehicle components such as the heating system and lights and the torque and/or braking forces delivered to the wheels. The information is acquired from sensors and/or from signals generated by the vehicle and is processed by the vehicle CPU or, in another embodiment, by a display CPU. The processed information is then displayed for the driver in black and white or in color using an LED, LCD, vacuum fl[u]orescent means, numerical display, gauge or meter.

The preferred images used in said display to convey said operating parameters are meaningful, symbolic, easily understood and spare in style. The presentation is in either black and white or color and the variety of types of display devices enumerated all generally serve to adequately display the needed information. Audible signals and/or warnings are used to augment these visual presentations. The preferred displays are time-variant, concise and appropriate for the information presented and include a proportional symbolic display, bar charts, a segmented bar chart, variable-size or variable-shape icon or images.

It is an object of the present invention to provide an improved display means and system for the display of vehicle operating parameters to an operator of a motor vehicle.

It is another object of the present invention to display information regarding the distribution of torque or driving forces at the wheels of a vehicle to the operator of the vehicle.

It is another object of the present invention to display information to the operator regarding the approach of a rollover condition of the vehicle.

It is another object of the present invention to collection information for display to an operator regarding the driving forces at the wheels of a vehicle by using a flux sensor or Hall effect sensor.

It is another object of the present invention to display to the operator of a vehicle, information regarding the usage of power by various power consuming components of the vehicle.

As disclosed by the present invention, the following items are new, useful applications of existing technologies for the display of information regarding the performance of a vehicle to the operator of the vehicle:

(1) the torque or driving forces being delivered to the wheels;

(2) the slippage of one or more wheels relative to the other wheels, particularly for four wheel drive vehicles;

(3) the accurate visual display of the approach of a rollover condition of the vehicle;

(4) the power being used by the power consuming components of a vehicle;

(5) the use of true audible warnings for the approach of a rollover condition of a vehicle.

These applications are not obvious as the required technologies are old and the need for these applications has been long standing. Until the present invention, they have been unavailable.

These and other objects an advantages of the present invention will become clear to those skilled in the art in view of the description of the best presently known mode of carrying out the invention and the applicability of the preferred embodiment as described herein and as illustrated in the several figures of the drawings.

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~~Description of the Drawings~~

Brief Description of the Drawings

~~Figure 1~~	~~Scalar bar diagram image~~
~~Figure 2-4~~	~~Braking display wheel images~~
~~Figure 5A~~	~~Delivered torque display wheel image~~
~~Figure 5B, 5C~~	~~Combination of torque and braking display wheel images~~
~~Figure 6A, 6B, 7A, 7B~~	~~Relative torque or speed display wheel images~~
~~Figure 8A, 8B~~	~~Diagrams of component monitoring, data processing and image display~~
~~Figure 9~~	~~Diagram of clutch monitoring, data processing and image display~~
~~Figure 10A, 10B~~	~~Inline connector and inserted coil~~
~~Figure 10C, 10D~~	~~Clamping induction coil~~
~~Figure 10E~~	~~In-line current sensing device~~
~~Figure 11A, 11B~~	~~Diagrams of ABS system monitoring, data processing and image display~~
~~Figure 12A, 12B~~	~~Diagrams of accelerometer and harmonic frequency sensors, data processing and image display~~
~~Figure 13~~	~~Torque display image~~
~~Figure 14~~	~~Diagram of wheel load sensor~~
~~Figure 15, 16~~	~~Torque display images~~
~~Figure 17A, 17B~~	~~Component power consumption display images~~
~~Figure 17C, 17D~~	~~Bar chart pie segment display images~~

~~Figure 18A, 18B~~	~~Diagrams of power component monitoring, data processing and image display~~
~~Figure 19A, 19B~~	~~Turn over display images~~
~~Figure 20~~	~~Diagram of display CPU function processing~~

Figure 1 is a display of a scalar bar diagram image of the braking force on the two rear wheels.

Figure 2 is a display of four wheel images representing the amplitude of the braking force on each wheel and the turning angle of the front wheels.

Figures 3 and 4 are displays of wheel images indicating the amplitude of the braking force on each wheel.

Figure 5A is a display of four wheel images representing the amplitude of the braking force on each wheel.

Figures 5B and 5C are displays of wheel images representing the amplitude of the relative amount of torque delivered to each of four wheels.

Figures 6A, 6B, 7A and 7B are each a display of a wheel image indicating the amplitude of the torque delivered to a wheel.

Figures 8A, 8B and 9 are each a diagram of a system schematically showing component monitoring, data processing means and an image display.

Figure 10A schematically illustrates an in-line connector.

Figure 10B schematically illustrates an in-line connector and an inserted coil.

Figures 10C and 10D illustrate a clamping induction coil.

Figure 10E schematically illustrates an in-line current sensing device.

Figures 11A and 11B are each a schematic diagram of an ABS system monitoring, data processing means and an image display.

Figures 12A and 12B are each a schematic diagram of an accelerometer and harmonic frequency sensor, data processing means and an image display.

Figure 13 is a display of a torque distribution image.

Figure 14 schematically illustrates placement of a wheel load sensor.

Figure 15 illustrates a display of torque and braking representations for four wheels.

Figure 16 illustrates a display of torque, braking and steering representations for the wheels of a four wheel vehicle.

Figures 17A and 17B each illustrate a display of symbols and/or numerals, each representing the power consumption of a system component.

Figures 17C and 17D each illustrate a bar chart pie segment display of images of power consuming components of a system.

Figures 18A and 18B are each a schematic diagram of power component monitoring, data processing means and an image display.

Figures 19A and 19B each illustrate a display indicating the approach to a rollover condition.

Figure 20 is a flow chart illustrating functional processing of information by a display CPU and system.

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Abstract

An apparatus, method, system and/or image editing process for presenting visual displays to the driver of a motor vehicle regarding the real time operating condition of the vehicle systems and components. These include the anti-lock braking system, the stability of the vehicle as to proximity to rolling over, the power consumed by vehicle components such as the ~~sheating~~ heating ~~systema~~ system and lights and/or, for four-wheel drive vehicles, the torque and/or braking forces delivered to the wheels. The information is ~~aquired~~ acquired from sensors and/or from signals generated by the vehicle and it processed by the vehicle CPU or, in another embodiment, by a display CPU~~, the information being presented~~[.] It is then displayed in black and white or in color using an LED, LCD, vacuum fl[u]orescent means, numerical display, gauge[,] ~~or~~ meter or PDA.

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1-65. (cancelled)

66. (original) A data collection and display system for a proper vehicle comprising:

at least one sensing means producing at least one source electric signal proportional to the distributed driving force of said proper vehicle;

at least one calculating means converting said at least one source electric signal to at least one electric display signal;

at least one electric signal transmission means connecting said sensing means to said at least one calculating means;

at least one display means; and

at least one electric display signal transmission means connecting said at least one calculating means to said at least one display means,

whereby said at least one electric signal transmission means transfers said at least one source electric signal from said sensing means to said at least one calculating means, said calculating means creating at least one electric display signal, said at least one electronic display signal transmitted by said at least one electric display signal transmission means to said at least one display means, said display means creating an image visible to the operator of said proper vehicle, said image proportionally depicting said driving force.

67. (amended) A data collection and display system as in Claim 66, wherein said at least one sensing means is a Hall effect sensor [[on or at said at least one clutch]].

68. (amended) A data collection and display system as in Claim 66, wherein said at least one sensing means monitoring a conductor, said conductor transmitting said control of said driving force [[to said at least one clutch]], said at least one sensing means comprised of a clampon induction sensor or an in-line induction sensor or an in-line series current sensor.

69. (new) A data collection and display system as in Claim 66 wherein, said image is at least one bar chart, scalar bar chart, ~~and/~~or an image displaying the torque ~~and/~~or braking force delivered to the wheels ~~and/~~or an image displaying the torque ~~and/~~or braking force delivered to the front pair of wheels and to the rear pair of wheels ~~and/~~or an image displaying the slippage of one or more wheels with regard to the other wheels.

70. (original) A data collection and display system as in Claim 66 wherein, said image is comprised of a display varying in time in one or more characteristics to include color, hue, shading, density of cross hatching, contrast, content, shape, orientation, pattern and/or illumination.

71. (original) A data collection and display system as in Claim 66, wherein said at least one display means is an LED, LCD, vacuum fluorescent means, GPS display and/or trip computer, numerical display, gauge, meter and/or PDA.

72. (original) A data collection and display system for a proper vehicle comprising:

a CPU controlling engagement forces of one or more of the wheels;

at least one sensing means producing an electrical input signal proportional to said engagement forces and providing said signal to said CPU;

at least one display signal generated by said CPU derived from said input signal, said display signal proportional to said engagement forces; and

at least one display device;

whereby said at least one display signal is transferred from said CPU to said display device, said display device displaying an image proportional to said engagement forces to the operator.

73. (original) A data collection and display system as in Claim 72 wherein, said image is comprised of a display varying in time in one or more characteristics to include color, hue, shading, density of cross hatching, contrast, content, shape, orientation, pattern and/or illumination.

74. (original) A data collection and display system as in Claim 72, wherein said at least one display means is an LED, LCD, vacuum fluorescent means, GPS display and/or trip computer, numerical display, gauge, meter and/or PDA.

75. (new) An apparatus comprising:

at least one signal source producing sensory data;

a processing device operably coupled to said signal source to transform said sensory data into a display signal; and a display device to receive and display said display signal as a viewable image, said image comprised of information regarding at least one operating parameter, said at least one operating parameter comprised of torque and/or braking forces delivered at the wheels of a motor vehicle;

whereby said image is observable by the operator of said motor vehicle.

76. (new) An apparatus as in Claim 75 wherein said at least one signal source is a sensor comprised of a brake signal amplitude sensor, a torque amplitude signal sensor, an in-line induction sensor, an inserted serial current sensor, a clampon induction sensor and/or a flux sensor.

77. (new) An apparatus as in Claim 75 wherein said image is at least one bar chart, scalar bar chart, or bar chart in pie segment format ~~and/~~or, is an image displaying the torque ~~and/~~or braking force delivered to the wheels ~~and/~~or, is an image displaying the torque ~~and/~~or braking force delivered to the front pair of wheels and to the rear pair of wheels ~~and/~~or an image displaying the slippage of one or more wheels with regard to the other wheels.

78. (new) An apparatus as in Claim 75 wherein said processing device is comprised of a vehicle CPU or a display CPU.

79. (new) An apparatus as in Claim 75, wherein said display device is a LED, LCD, vacuum fluorescent means, GPS display or trip computer, numerical display, gauge, meter and/or PDA.

80. (new) An apparatus as in Claim 75, wherein said at least one image is comprised of a highlighted image and/or a display varying in time in one or more characteristics to include color, hue, shading, density of cross hatching, contrast, content, shape, orientation, pattern and/or illumination.

81. (new) A system comprising:

a first data signal generation means affixed to or within a vehicle and producing a first data signal, said first data signal generation means comprised of a lateral acceleration sensor;

a first interface to receive said first data signal;

a second data signal generation means affixed to or within said vehicle and producing a second data signal, said second data signal generation means comprised of a harmonic frequency sensor;

a second interface to receive said second data signal;

a processing device operably coupled to said interfaces to transform said data signals into at least one frame of display data; and

a display device displaying said at least one frame of display data for the operator of said vehicle;

whereby said display data comprises at least one image indicating the approach of a rollover condition of said vehicle.

82. (new) A system as in Claim 81, wherein said processing device is comprised of a vehicle CPU or a display CPU.

83. (new) A system as in Claim 81, wherein said display device is a LED, LCD, vacuum fluorescent means, GPS display and/or trip computer, numerical display, gauge, meter and/or PDA.

84. (new) A system as in Claim 81[;] wherein said image is comprised of a display varying in time in one or more characteristics to include color, hue, shading, density of cross hatching, contrast, content, shape, orientation, pattern, illumination and/or highlighting.

85. A system as in Claim 81[;] wherein said image is comprised of a display of at least one bar chart, scalar bar chart or bar chart in pie segment format.

86. (new) A method comprising:
generating a data signal from at least one sensor attached on or within a motor vehicle;
processing said data signal producing at least one display image; and
displaying said at least one display image on a display device observable by the operator of said motor vehicle;
whereby said at least one display image comprising at least one image representing information regarding at least one vehicle operating parameter, said at least one operating parameter comprised of torque and/or braking forces delivered at the wheels of said motor vehicle.

87. (new) A method as in Claim 86, wherein said vehicle is a four-wheel drive vehicle.

88. (new) A method as in Claim 86, wherein one of said operating parameters displayed is the steering angle of the front wheels.

89. (new) A method as in Claim 86, wherein said at least one sensor is comprised of a torque amplitude signal sensor.

90. (new) A method as in Claim 86, wherein said processing is by said vehicle's CPU or by a display CPU.

91. (new) A method as in Claim 86, wherein said displaying is with a LED, LCD, vacuum fluorescent means, GPS display, numerical display, gauge, meter and/or PDA.

92. (new) A method as in Claim 86, wherein said at least one display image is a bar chart, scalar bar chart, bar chart in pie segment format, a numerical display ~~and/~~or an image displaying the torque ~~and/~~or braking force delivered to the wheels ~~and/~~or an image displaying the slippage of one or more wheels with regard to the other wheels.

93. (new) A method as in Claim 86, wherein said image is comprised of a display varying in time in one or more characteristics to include color, hue, shading, density of cross hatching, contrast, content, shape, orientation, pattern, illumination and/or highlighting.

94. (new) An image creating and sound creating device comprising:

a first data signal generation means affixed on or within a vehicle and producing a first data signal;

a first interface to receive said first data signal;

a second data signal generation means affixed on or within said vehicle and producing a second data signal, said second data signal generation means comprised of a harmonic frequency sensor;

a second interface to receive said second data signal;

a processing device operably coupled to said interfaces to transform said first and second data signals into at least one frame of display data and into an electronic sound signal;

a display device displaying said at least one frame of display data for the operator of said vehicle; and

a sound producing device converting said electronic sound signal to audible sound for said operator;

whereby said display data comprising said at least one frame of display data is displayed and/or said sound producing device creates said audible sound regarding at least one vehicle operating parameter and said at least one operating parameter is the approach of a rollover condition of said vehicle.

95. (new) The device of Claim 94, wherein said vehicle is a four-wheel vehicle.

96. (new) The device of Claim 94, wherein said [a] first data signal generation means is a lateral acceleration sensor ~~and said second data signal generation means is a harmonic frequency sensor~~.

97. (new) The device of Claim 94, wherein said processing device is comprised of a vehicle CPU or a display CPU.

98. (new) The device of Claim 94, wherein said display device is a LED, LCD, vacuum fluorescent means, GPS display and/or trip computer, numerical display, gauge, meter and/or PDA.

99. (new) The device of Claim 94, wherein said image is at least one bar chart, scalar bar chart, bar chart in pie segment format, a numerical display and/or an image displaying the approach of a rollover condition of a vehicle.

100. (new) The device of Claim 94, wherein said at least one image is comprised of a display varying in time in one or more characteristics to include color, hue, shading, density of cross hatching, contrast, content, shape, orientation, pattern, illumination and/or highlighting.

101. (new) An item comprising a medium storing instructions that, if executed, enable a system to perform steps comprising:

receiving a data signal comprised of information regarding at least one operating parameter;

generating from said data signal a command;

transforming said data signal based on the command into display information; and displaying said display information on a display for the operator of a motor vehicle; whereby said at least one operating parameter comprises the power consumption of a vehicle component.

102. (new) The item of Claim 101, comprising a medium storing instructions that, if executed, enable a ~~process-based~~ system to perform steps to transform said data signal by using a vehicle CPU or a display CPU.

103. (new) The item of Claim 101, comprising a medium storing instructions that, if executed, enable a ~~process-based~~ system to display said display information on a LED, LCD, vacuum fluorescent means, GPS display and/or trip computer, numerical display, gauge, meter and/or PDA.

104. (new) The item of Claim 101, comprising a medium storing instructions that, if executed, enable a ~~process-based~~ system to display an image comprised of at least one bar chart, scalar bar chart, bar chart in pie segment format, ~~and/~~or at least one image of a power consumption component and associated bar chart, ~~and/~~or an image of at least one power consumption component and associated numerical display.

105. (new) The item of Claim 101, comprising a medium storing instructions that, if executed, enable a ~~process-based~~ system to display said image varying in time in one or more characteristics to include color, hue, shading, density of cross hatching, contrast,

content, shape, orientation, pattern, illumination and/or highlighting.

106. (new) A data collection and display system for a proper vehicle comprising:
a first CPU controlling engagement forces of one or more of the wheels;
at least one sensing means producing an electrical input signal proportional to said engagement forces and providing said signal to a second CPU;
at least one display signal generated by said second CPU derived from said input signal, said display signal proportional to said engagement forces; and
at least one display device;
whereby said at least one display signal is transferred from said second CPU to said display device, said display device displaying an image proportional to said engagement forces to the operator.

107. (new) A data collection and display system as in Claim 106 wherein, said image is comprised of a display varying in time in one or more characteristics to include color, hue, shading, density of cross hatching, contrast, content, shape, orientation, pattern, illumination and/or highlighting.

108. (new) A data collection and display system as in Claim 106, wherein said at least one display means is an LED, LCD, vacuum fluorescent means, GPS display and/or trip computer, numerical display, gauge, meter and/or PDA.

109. (new) A data collection and display system as in Claim 106, wherein said first CPU and said second CPU are the same CPU.